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Research Report

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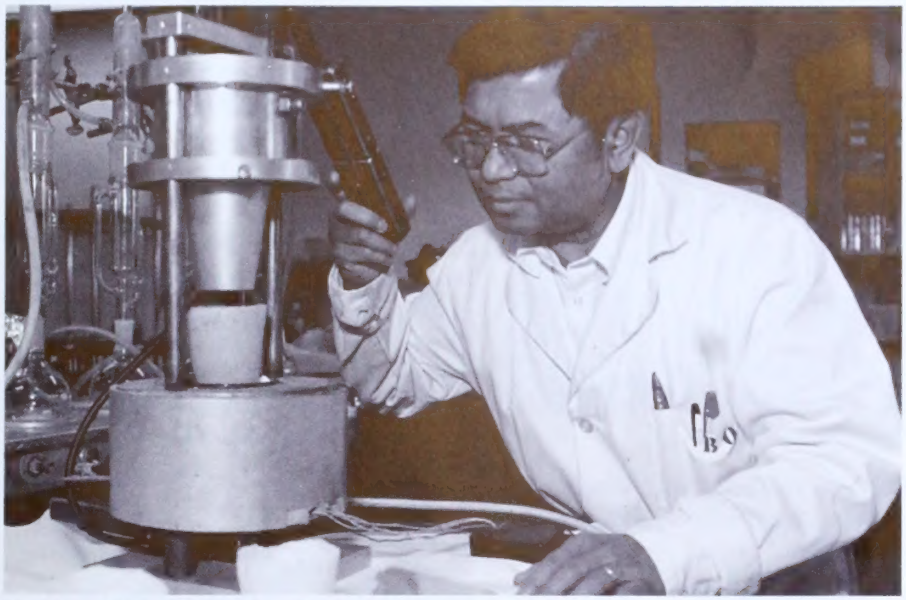

U of A professor, Dr. B. Ooraikul, demonstrates prototype equipment for edible food containers.

Edible Inedibles

Edible, biodegradable food packaging on the horizon

Years ago, the thought of eating a coffee cup may have been greeted with laughter. But thanks to leading-edge agri-food research, the idea is now closer to making believers of the skeptics. A University of Alberta research team and a private company have teamed up to develop edible containers for: hot and cold beverages; warm or cold foods (soups, hamburger, chili con carne, ice cream); and stirsticks for tea and coffee.

RESULTS TO DATE

Development of edible packaging and a moisture-resistant sealant.

POTENTIAL BENEFITS

- Additional markets for producers.
- Expanded profitability of Alberta's processing sector by diversification and value addition.
- Reduction of waste in Alberta's environment as per the National Packaging Protocol.

The **Alberta Agricultural Research Institute (AARI)** matched contributions from Vancouver-based Rhyme Industries Inc to support research led by Dr. Buncha Ooraikul, Professor in the U of A's Department of Agricultural, Food and Nutritional Science. AARI's **Matching Grants Program** raises overall research dollars through industry contributions, usually on a dollar-for-dollar basis.

"Although the project experienced a hiatus period due to private sponsor changes," explains Dr. Ooraikul, "we are excited with the results and potential benefits to date, particularly since Rhyme became involved."

The first step was to discover the packaging composition. "We came up with simple potato and wheat starch as the basic ingredients," Dr. Ooraikul continues. "These materials are available locally at reasonable prices. They should provide potato and wheat producers with additional markets."

After the right combination of ingredients was determined, the researchers faced another big challenge. Dr. Ooraikul explains, "The critical stage in formulation was to discover an edible sealant and an effective method of application to the packaging. We found a food-based substance that does the job. It is our 'secret ingredient'. We now have a watertight package that retains its contents and possesses acceptable texture, flavour, taste and colour properties."

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TechTransfer

Copper fertilization showing benefits

Copper fertilization eliminates melanosis in wheat (left stems and heads).

"This could be the next nitrogen." I recall this statement made to me two years ago by Dr. Ieuan Evans, Supervisor, Plant Pathology, with Alberta Agriculture, Food and Rural Development's (AAFRD) Agronomy Group. "This" refers to copper, a soil micronutrient essential for plant and animal growth. Wheat and barley respond best to copper enrichment.

Dr. Evans is part of an agronomy team studying various aspects of copper deficiency in Alberta soils. Three other researchers particularly involved are AAFRD's Elston Solberg, Doug Penney and Denise Maurice. Their combined thirty years of intermittent research on copper deficiency is leading-edge in North America. "There is no doubt that AAFRD's research is way out in front of what has been done elsewhere," advises Evans.

RESULTS TO DATE

Increased wheat and barley yield by most producers applying copper to deficient soil.

POTENTIAL BENEFITS

Tremendous increase in revenue for both crop and livestock sectors.

Initial reporting on copper deficiency appeared in the September 1992 *Research Report*. The research team found dramatic yield increase and disease reduction in wheat and barley when copper was applied to deficient soil in test plots.

"Copper deficiency occurs in roughly 3 million acres or 10% of all cropland in Alberta. The difficulty, though, is convincing producers that copper deficiency occurs not just in sandy-loam or high-organic soils," says Dr. Evans. "Its distribution is patchy. Soil samples must be analyzed to determine if copper is required. When copper application is appropriate, we have seen incredible yield increases (100% and upwards) and complete disease elimination."

According to some, Dr. Evans is on a crusade. "I am," he admits. "The potential benefits in increased revenues are phenomenal. But changing attitudes can take a long time."

Many producers and fertilizer dealers believe Dr. Evans could not be more right. "I would no sooner stop copper fertilization than not use treated seed," says Ellerslie producer Ralph Buhler. "Since using copper five years ago, I have seen yield increases as high as 50% in my Roblin wheat and 40% in Winthrop barley. A number of producers I know have also had much success using copper."

The fertilizer industry is another beneficiary of copper use. Dealer sales of copper products increased within the past 2-5 years. "Our sales of MicroBlue increased six-fold since 1993," says Ray Dowbenko, Research and Extension Agronomist with Sherritt Inc. That would be 300 tonnes in 1993 to 1500-1700 ordered tonnes in 1995. Quantities are not huge, but the steady rise is a sign the product works. In fact, 75% of producers using MicroBlue have obtained higher yields." Dr. Evans advises other manufacturers are selling more copper products across the prairies.

In addition to the copper team's research, the Alberta Agricultural Research Institute (AARI) has supported several copper research and demonstration projects. Between April 1992 and February 1995, for example, six copper fertilization projects received a total of $30,000 under AARI's **Farming for the Future On-Farm Demonstration Program**.

Funding copper research and demonstration projects is money well-spent according to Serecon Management Consulting Inc of Edmonton. They estimated a potential economic return from one **Farming for the Future Research Program** project, "Copper Deficiency: Crop/Variety Response, Disease and Herbicide Interactions". From AARI's research support of about $40,000, Serecon estimated a **staggering return to the province of $315 million**

(1992 dollars) over 13 years! The estimated return would be even higher today given significant grain price increases since 1992.

Dr. Evans' work has enjoyed recent media exposure, including an appearance on "Country Canada" and the "CBC National News". "The solution is so easy," he exclaims in the interviews, "and copper products are cheap relative to yield returns."

Copper application does not just benefit grain producers and agri-food companies. Dr. Terry Church, Director of AAFRD's Animal Industry Division, informs, "We have known that copper deficiency is a problem in cattle and sheep in many areas since the 1970s – not just in Alberta, but across North America."

"It is difficult to diagnose at chronic levels," continues Church, "but can be a serious problem – leading to death – in an acute deficiency. It is difficult to put a dollar figure on revenues lost to deficiency, particularly since we are talking about feed in combination with nutritional supplements. As well, copper enrichment of forages is not practiced in Alberta. But there is little doubt that copper-rich feed would increase profitability. One caution: copper toxicity can be a problem. Sheep, in particular, are susceptible to copper poisoning."

Evans concludes, "In addition to the fertilizer industry benefiting, even laboratories have increased their business. Norwest Labs in Edmonton has had a 35% increase in soil analyses. So the whole industry benefits tremendously!"

The next time the "copper doctor" knocks on your door, hear him out. He may not be selling snake oil.

Anyone wishing to contact Dr. Evans can do so by calling (403) 427-7098.

Edible food packaging (cont'd)

According to Mr. Brian Birmingham, Rhyme's Chief Executive Officer, "The notion of edible packaging and utensils is not a re-invention of the wheel. It was attempted in several countries, particularly European. For example, plates and cups were used at the **1994 Lillehammer Winter Olympics**. They were edible but not moisture-resistant. The remaining key modification was sealant application capability."

Molding containers, however, has been the biggest challenge facing the researchers. Dr. Ooraikul states, "In our laboratory, we developed primitive equipment for shaping the package. Unfortunately, the workup model lacked fine control for uniform heating. This resulted in an irregular cup without strength to hold product or withstand rough handling."

To overcome this stumbling block, Dr. Ooraikul and Mr. Birmingham are relying on an alliance with Austria's **Franz Haas Company**, one of the largest equipment manufacturing plants in the world.

Mr. Birmingham advises, "If our trip to Austria results in acceptable package construction – good formation, strength, edibility factors – then we believe commercialization to be close at hand. Franz has the packaging technology but not the success with sealant development.

Each of us has a technology the other needs. We have already signed an agreement we believe will form the basis of a lucrative international relationship. Alberta will be a major beneficiary. As Rhyme has made clear, we are absolutely committed to building a commercial facility in Alberta. Right now, we are thinking of a site somewhere between Edmonton and Calgary."

This would provide a real 'shot in the arm' to Alberta's food processing sector. Mr. Birmingham's forecasts, "We also have plans for manufacturing food additives and by-products from rhubarb. And we are in the process of test-marketing baked potatoes with manufactured skins." Research by Dr. Ooraikul on rhubarb by-products and manufactured potato skins has been funded by AARI.

Dr. Ooraikul concludes, "Let us not forget the dramatic benefit to the environment. Of course, we hope to continue fine-tuning the package taste, texture and other sensory qualities with the hope that consumers will eat the package. However, if they choose not to, the packaging is completely and quickly biodegraded, whether in landfills or as litter."

Dateline

Summer
AARI will accept and manage applications for The Beef Industry Development Fund Committee.

Summer
Farming For The Future On-Farm Demonstration Program – farm tours and demonstrations throughout province.

November 1
Deadline for research proposal applications under the following programs: Matching Grants; Farming for the Future Research; and Research Coordination.

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Beef Industry Development Fund Announces Priorities

AARI now managing BIDF beef research projects

On February 21, 1995, the Canadian Cattlemen's Association issued a news release to announce the Beef Industry Development Fund Committee (BIDF) funding priorities. Priorities relate to project allocations from a $21 million fund.

Larry Sears, BIDF Chairman, indicated that "the industry and governments are pleased that these funds will be used in long-term partnering initiatives to enhance the competitiveness of the Canadian beef industry."

The Alberta Agricultural Research Institute is actively involved in the new initiative. AARI's role is management of beef research and technology transfer projects within the initiative. The four areas of priority are:

1. Export market development, focusing on Pacific-Asia.
2. Domestic market development.
3. Research in beef quality issues.
4. Training and technology transfer.

Editorial

While promoting the 1992 Farming for the Future Conference, a member of the media asked a question that still sticks in my mind. After discussing the conference agenda, which included research results from agricultural biotechnology, I was asked, "Are you going to have any of those glow-in-the-dark potatoes on display?"

In essence, this statement captured the popular belief about biotechnology. Many fervently believe we should not be "fooling" with genetic material – the blueprint of life. "It is not natural", and, "We do not want to unleash deadly epidemics or three-headed killer cows from the laboratory", are typical comments.

These notions, fed by alarmist and tabloid reporting, are pure poppycock. They may also be offensive to the many dedicated researchers who use biotechnology, a powerful, leading-edge technology that is as safe as other techniques, but produces results in a fraction of the time of traditional procedures.

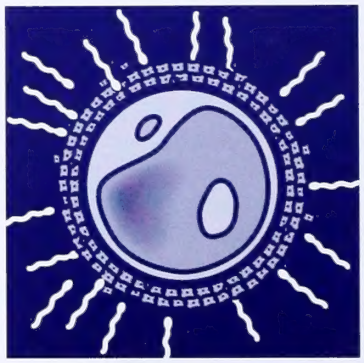
Think of biotechnology as a high-tech power tool from your workshop. Biotechnology is merely an instrument to help scientists and researchers discover – "better and faster".

In agriculture, biotechnology has developed, to name a few: vaccines to fight animal diseases; high-yielding, disease-resistant crops; and altered lactic acid bacteria – lactics are present in cheese and yoghurt cultures – to extend the storage life of pork and other meats.

The list of biotechnology's accomplishments in agri-food research is exhaustive. Results are difficult to measure, but commercial benefits have been tremendous and hold greater future promise.

Accepting biotechnology as any other research technique is simply a matter of education. More information will de-mystify biotechnology to the point where it will be accepted as a common research strategy to achieve research results and improve profitability in Alberta's agri-food industry.

Visions of monstrous corn plants with teeth are best left in the realm of science fiction.



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